

IN THE CLAIMS:

Claims 1-9 and 29 were previously canceled. Claims 26 and 32 have been amended herein. All of the pending claims 1 through 37 are presented below. This listing of claims will replace all prior versions and listings of claims in the application. Please enter these claims as amended.

1.-9. (Canceled)

10. (Previously presented) A method of removing oxide polymer and metal polymer from a contact opening extending through at least one dielectric layer to an exposed region of a metal-containing layer on a semiconductor substrate, the method comprising applying a solution consisting essentially of a nitric acid solution dip on the contact opening without substantially removing the exposed region of the metal-containing layer followed by a phosphoric acid solution dip.

11. (Previously presented) The method of claim 10, further comprising applying the nitric acid solution at a concentration of between about 50% and 100% by weight.

12. (Previously presented) The method of claim 10, further comprising applying the nitric acid solution for a time span of between about 10 seconds and 30 minutes.

13. (Previously presented) The method of claim 12, further comprising applying the nitric acid solution in a time span of about 200 seconds.

14. (Previously presented) The method of claim 10, further comprising applying the nitric acid solution at a temperature of between about 10° C and 80° C.

15. (Previously presented) The method of claim 10, further comprising performing the phosphoric acid solution dip at a concentration of between about 200 volumes of water to about 1 volume of phosphoric acid and about 1 volume of water to about 1 volume of phosphoric acid.

16. (Previously presented) The method of claim 10, further comprising applying the phosphoric acid solution dip at a temperature of between about 10° C and 80° C.

17. (Previously presented) The method of claim 10, further comprising applying the phosphoric acid solution dip for a time span of between about 10 seconds and 10 minutes.

18. (Previously presented) The method of claim 10, wherein the phosphoric acid solution dip further includes a fluorine-containing component.

19. (Previously presented) The method of claim 18, wherein the fluorine-containing component includes hydrofluoric acid.

20. (Previously presented) The method of claim 18, wherein the fluorine-containing component includes ammonium fluoride.

21. (Previously presented) A method of fabricating a via in a dielectric layer and an underlying barrier layer for a semiconductor device, comprising:
forming a partial via in the dielectric layer to expose at least portion of the barrier layer;
cleaning the partial via having at least a portion of the barrier layer exposed with a phosphoric acid-containing solution including a fluorine-containing component;
etching the barrier layer after the cleaning to form a full via, a bottom surface thereof defined by a surface of a metal-containing trace; and
applying a nitric acid-containing solution to the full via.

22. (Previously presented) The method of claim 21, further comprising applying the nitric acid-containing solution at a concentration of between about 50% and 100% by weight.

23. (Previously presented) The method of claim 21, further comprising applying the nitric acid-containing solution for a time span of between about 10 seconds and 30 minutes.

24. (Previously presented) The method of claim 23, further comprising applying the nitric acid-containing solution in a time span of about 200 seconds.

25. (Previously presented) The method of claim 21, further comprising applying the nitric acid-containing solution at a temperature of between about 10° C and 80° C.

26. (Currently amended) The method of claim 21, further comprising cleaning the partial via with the phosphoric ~~acid~~—acid—containing solution at a concentration of between about 200 volumes of water to about 1 volume of phosphoric acid and about 1 volume of water to about 1 volume of phosphoric acid.

27. (Previously presented) The method of claim 21, further comprising cleaning the partial via with the phosphoric acid-containing solution at a temperature of between about 10° C and 80° C.

28. (Previously presented) The method of claim 21, further comprising cleaning the partial via with the phosphoric acid-containing solution for a time span of between about 10 seconds and 10 minutes.

29. (Canceled)

30. (Previously presented) The method of claim 21, wherein the fluorine-containing component includes hydrofluoric acid.

31. (Previously presented) The method of claim 21, wherein the fluorine-containing component includes ammonium fluoride.

32. (Currently amended) A method of fabricating a via in a dielectric layer and an underlying barrier layer for a semiconductor device, comprising:
forming a partial via in the dielectric layer to expose at least a portion of the barrier layer;
cleaning the partial via having at least a portion of the barrier layer exposed with a phosphoric acid-containing ~~solution~~; solution;
etching the barrier layer after the cleaning to form a full via, a bottom surface thereof defined by a surface of a metal-containing trace; and
applying a nitric acid-containing solution a concentration of between about 50% and 100% by weight to the full via.

33. (Previously presented) A method of fabricating a via in a dielectric layer and a barrier layer for a semiconductor device, comprising:
removing a portion of the dielectric layer overlying the barrier layer to form a partial via
exposing at least portion of the barrier layer;
cleaning the partial via with a phosphoric acid-containing solution at a concentration of between about 200 volumes of water to about 1 volume of phosphoric acid and about 1 volume of water to about 1 volume of phosphoric acid;
etching the barrier layer to expose a region of a metal-containing trace underlying the barrier layer after the cleaning to form a full via; and
applying a nitric acid-containing solution to the full via.

34. (Previously presented) A method of fabricating a via in a dielectric layer and an underlying barrier layer for a semiconductor device, comprising:
forming a partial via in the dielectric layer to expose at least portion of the barrier layer;
cleaning the partial via with a solution comprising water and phosphoric acid at a ratio of about 20:1 by volume at a temperature of about 35° C;
etching the barrier layer after the cleaning to form a full via having a metal containing trace on a bottom surface thereof; and
applying a nitric acid-containing solution to the full via.

35. (Previously presented) A method of fabricating a via for a semiconductor device, the method comprising:
removing at least a portion of a dielectric material exposed through an opening in an etch mask;
forming an oxide polymer layer on surfaces of the opening after removing at least a portion of the dielectric layer;
removing a barrier layer underlying the opening to expose at least a portion of a metal-containing layer and to form a metal polymer layer over the surfaces of the opening;
exposing the opening to a nitric acid-containing solution;
substantially removing the metal polymer layer without substantially removing the exposed portion of the metal-containing layer;
exposing the opening to a phosphoric acid-containing solution; and
substantially removing the oxide polymer layer.

36. (Previously presented) The method of claim 35, wherein the exposing the opening to the phosphoric acid-containing solution is performed before the removing the barrier layer underlying the opening.

37. (Previously presented) The method of claim 35, wherein the exposing the opening to the nitric acid-containing solution is followed by exposing the opening to a phosphoric acid-containing solution.